NASA ARC and ISFMs: Status, Updates

Jeffery Hollingsworth
Chief, Planetary Systems Branch
Space Science and Astrobiology Division
NASA Ames Research Center (ARC)

NASEM/Planetary Advisory Committee (PAC) Meeting
(virtual, WebEx)

30 Nov 2020

Background & Motivation

- On the heels of the Agency *Science Enabling Research Activity* ("SERA") Study Final Report (2014), ARC & Code S/SS commenced work (2016) on further opportunities for HQ/SMD Directed Work Packages (DWPs = later to become ISFMs)
- ARC received HQ/SMD/PSD first "Call" in late 2016/early 2017 for ISFMs
  - Planetary Systems Branch (Code SS/SST) [2]
  - Exobiology Branch (Code SS/SSX) [1] → [4]
  - Several Discussions/Negotiations with the SMD/PSD Stakeholders: Senior Leadership + Program Officers/Executives
- FY2018 Q1 first ISFMs emplaced (i.e., 6 for ARC Code S/SS) [6 + (1) = 7]
- FY2018 Q2/Q3 ARC received SMD/PSD request *for next FY submissions*
- Change of SMD/PSD Senior Leadership*; the FY2019 *enactment of the SMD ISFM Implementation Plan*; and, where we are today (i.e., interim programmatic reviews for the Pilot Program; addressing issues raised, etc)

NASA CS Research Scientist: SERA Report

- ***Flight Project/Programs***
  - Fulfills directed and/or competed assignments matching Agency goals and objectives
  - Spans and leverages "matrixed staff" through science projects across field Center Orgs (e.g., Code R, Code T, Code S, namely Engineering, Technology and Science)

- ***Science-and-Research Enabling Work I***
  - Provides service/support of science research conducted by the community (i.e., the community relies on results of this activity)
  - Utilizes and stewards unique NASA facilities, capabilities and/or skills
  - Requires long duration/scope that benefits the Government by "in house" science support at its field Centers
  - Maintains long-term stability (i.e., not a typical ROSES period of performance, ~3 yr per se); a capability whose availability is required (perhaps not at all times) but very costly to resurrect the capability (i.e., extra-cost avoidance)
  - Applies knowledge/expertise to multiple, cross-cutting scientific questions (i.e., it is interdisciplinary and not distinct to one scientific "niche"/scientific question, only)

- ***Science-and-Research Enabling Work II***
  - Harnesses a long-term "stability" (i.e., no interruptions nor unnecessary re-starts)
  - Provides a research service and not just only one (multiple) answer(s) to a hypothesis-driven scientific question(s)
  - Enhances ongoing/existing community efforts to increase science return to HQ/SMD

Space Science & Astrobiology Division ISFMs

- ***Mars Climate Modeling Center*** (MCMC): Lead, Melinda Kahre
- ***Planetary Formation & Exoplanets Theory*** *(PFET)*: Lead, Jeff Cuzzi
- ***Habitable Environments & Biosignatures*** (HEB): Lead, Niki Parenteau
- ***Center for Life Detection*** (CLD): Lead, Tori Hoehler
- ***Microbial Innovation & Ecosystems Research*** (MIER): Lead, Craig Everroad
- ***Evolutionary Processes That Drove the Emergence and Early Distribution of Life*** (EPDEL): Lead, Mark Ditzler
- ***Laboratory Astrophysics Directed Work Package**** (LADWP): Lead, Ella Sciamma-O'Brien (*mostly SMD/APD)

Adheres to SMD ISFM Implementation Plan

- NASA CS Scientists are funded typically by a variety of sources: s/c flight projects/programs; competed R&A; Agency & science community service; directed work; and more
- CS Scientist funding model and its over-competition is inefficient for the $K opportunities that exist to internal and external scientists
  - much time expended for *fractional 0.1–0.2 FTE* via proposal *writing* and *submission* versus *serving* Agency's science goals, objectives internally
- ISFMs should be strategic, forward-leaning and distinctive, and carried out only at a NASA Center to provide value to the community and to *serve* the Agency/SMD and its science and exploration goals on long time scales
- Early career scientists are frequently negatively affected: difficult to "break in" to funding sources; ISFMs positively assist in this arena
- CS scientist research also involves on-site and off-site contractors, Cooperative Agreements and support (e.g., IT security) services to "get the work done"

Metrics & Data

Work Package	*No. of active subtasks*	*No. of participants (CS + CN)*	*Proposals not submitted*	*Panel service (incl ext)*	*Papers and book chapters*	*Conference presentations*	*New External Collaborations*
MCMC	5	4 + 8	21	19	21	45	32
PFET	2	4 + 3	1	1	50	N/A	17
EPDEL	5	5 + 11	2	1 (11)	6	12	17
MIER	4	3 + 3	3	10 (7)	7	5	16
HEB	6	7 + 9	7	14 (25)	16	27	29
CLD	5	11 + 5	12	23 (34)	2	4	55
LADWP*	5	4 + 8	15	17	28	20	33

*HQ/SMD/PSD & APD

ISFM Interim (Mid-term) Reviews

ARC: sample take-aways — external critical feedback appreciated overall

(positive)

- Science was timely, diverse and highly relevant to future mission planning; foundational research work in important planetary science areas; world-class science demonstrated; real-time course corrections demonstrated, especially during global pandemic
- Team has a positive impact on the community; science productivity (publications) was substantial/exemplary
- Significant progress developing state-of-the-art computational codes demonstrated and for eventual access by the community
- High reward, high risk project and tasks; novel approaches to long-standing problems with strong impacts

(negative)

- Limited strategies/plans were discussed re cross-pollination among the described ISFM tasks
- Few meaningful ties and involvement to specific s/c missions; ARC ISFM Team appears insular
- Delivery of state-of-the-art tools to the community delayed, ineffective
- Little discussion how proposed activities would connect to RCNs
- Limited discussion of integrated future plans across ISFM components; progress falls somewhat below expectations, especially website population, community access

COVID-19 & ISFM Impacts

- **MCMC; PFET–**
  - Reductions to scientific productivity and inefficiencies (10–25%); remote (computational/modeling/analysis) telework appears to be a valid modality
- **HEB, EPDEL, CLD, MIER–**
  - Reductions to scientific productivity and inefficiencies (25–60%); no access to labs on-site and field sites heavily impacted (e.g., remotely detectible photosynthetic biosignatures in the field postponed; delayed work on nucleic acids extraction/sequencing; vendor orders for work approved and yet not spent; necessary and serious rescopes in planned projects)
- **LADWP–**
  - Reductions to scientific productivity and inefficiencies (25–60%); no access to lab astrophysics facilities to carry out critical work (e.g., further measurements and synthesis of ice/dust spectra, extensions of PAH database to different wavelengths)
- **Early Career (NPPs, graduate, undergraduate) and Pathways/IEP**
  - Graduate student loss of lab experiment (headed back home); international intern headed back home to Europe; PhD in critical phase (can not complete); NPP arrival from east coast (w/ two small children): no support here at Center, environs; onboarding impacted; delayed mentor of new Pathways intern within Branch

Summary & Thoughts

- *Science is very timely, diverse and of high impact*, larger science projects and teams than a typical 3-yr cycle typical ROSES award
- ISFMs have demonstrated a *decreased burden on CS proposal writing* and more time for service, science and publication
- CS are *more involved in SMD panel reviews* (in person, virtual, external)
- *Inclusion* of Early-Career scientists *in large and dynamic science teams* (graduate students, interns, recent postdocs) with *key contributions*
- Strengthens inter-Center connections and *collaborative/supportive community science*
- Development of tools and database that are of *service to the community*
- *More strategic assignments* of CS staff to HQ/SMD and its Divisions
- *Foundational research* in *important planetary science areas*; world-class science demonstrated with extensibility and s/c mission support
- High reward, high risk project and tasks; *novel approaches to long-standing problems*


Questions?